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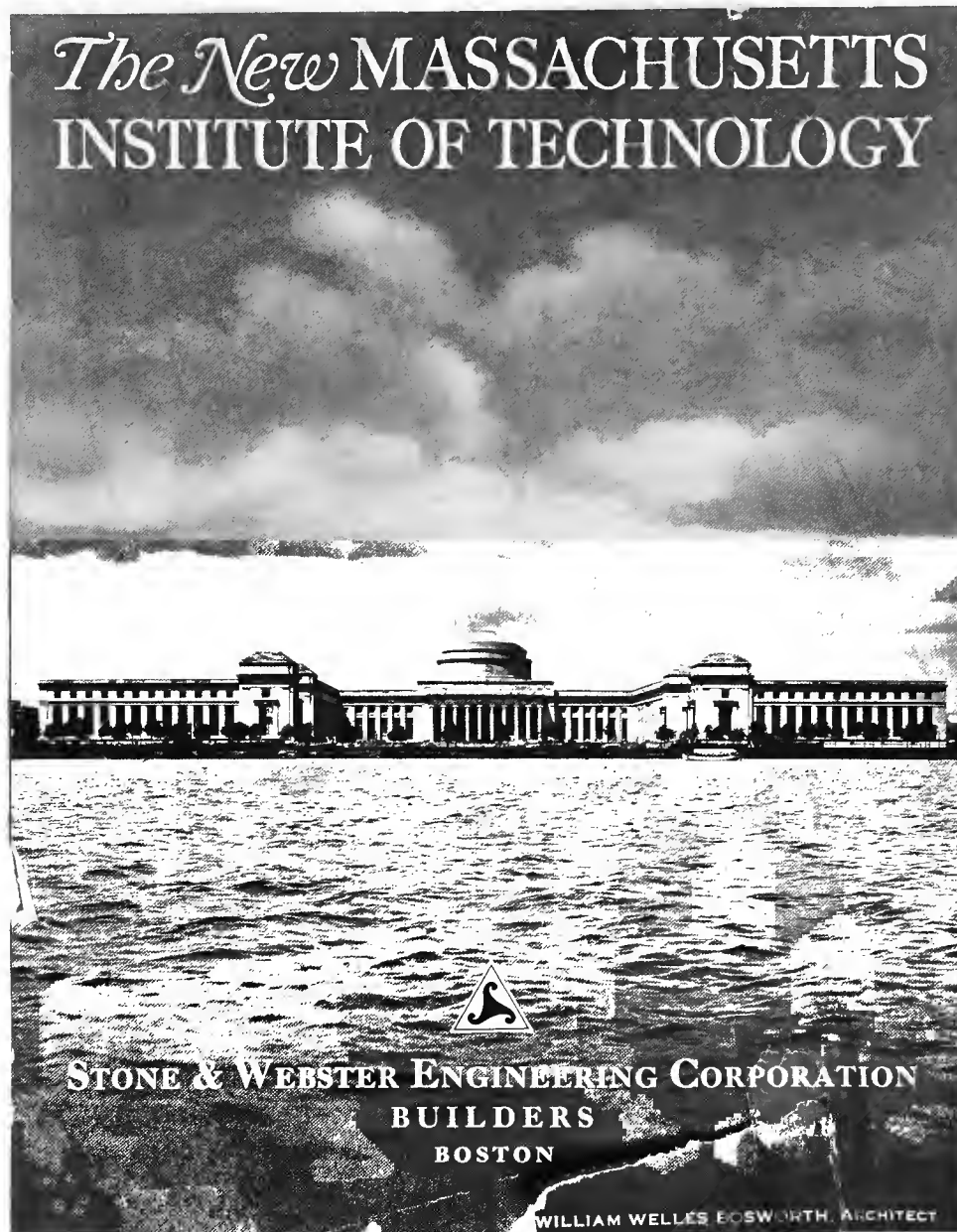
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THE ARCHITECTURAL REVIEW



FIFTY
CENTS

JUNE 1916
FOUNDED 1887

VOL IV
NO VI

A Reprint From The Architectural Review

Volume IV (Old Series, Vol. XXI)

June, 1916

Number 6

^z Building the "New Technology"

By H. E. Kebbon

Resident Architect

THE new Technology buildings are completed according to schedule, and are ready for inspection by the visiting hosts of Alumni who are gathering from all over the country for the dedication exercises on June 14, 1916.

The architectural scheme for these new buildings differs in two important essentials from the usual method of housing educational institutions. These two differences are basic, and the reasons that have caused their adoption are of interest.

First, instead of arranging the buildings about one axial line passing through the center of the site, two axes were established, both at right angles to the river front. (See Plate LXVI.) Upon the axis dividing the western half of the property it was decided to erect the main Technology buildings; and upon the eastern axis the residential buildings are to be grouped, including the Commons, Walker Memorial, Club House, Gymnasium, and Athletic Field.

The second radical departure from the usual has been the adoption of one enormous structure, to provide space for all the different departments under a continuous roof, instead of dividing them into separate buildings.

To take up first the division of the land — the scheme of dividing it into two distinct units was adopted as a

matter of common-sense convenience. The general proportions of the property do not favor a group of buildings around a central courtyard and extending along the entire frontage of the property. The importance of the river frontage forced its recognition as the principal façade, and it was obvious that the study buildings should adjoin Massachusetts Avenue, the main thoroughfare, by which the buildings would be approached from the residential sections of Boston and Cambridge. Locating this main group of buildings on the western half of the site made it also possible to obtain the view into the courtyard when approaching the site across the Harvard Bridge.

proaching the site across the Harvard Bridge.

From an architectural standpoint it became clear that the most effective treatment was a system of courts, with the principal court opening towards the water, thus giving a southern exposure; the whole dominated by a dome rising above a colonnaded portico at the northern end, which serves to tie the group together and to emphasize the character of the whole.

Opening out from this Main Court to the east and west are two small lateral courts, which will have a certain atmosphere of seclusion. All these courts will be paved, with grass plots framing the paved areas, and with trees



Fig. 1. Looking East across Opening of Forecourt
WEST



Fig. 2. View of Buildings from Corner of Massachusetts Avenue and Charles River Road, Sept. 10, 1915

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and shrubbery to add color and interest to the ensemble. Stone balustrades and seats also will tie the various units together.

After consideration there was no doubt that a single building to house all the class-rooms, offices, and laboratories of the various departments was the most practical solution. The departments are so used that students are continually passing from one to another, and combining them in one building was an obvious convenience and saving of time.

Sufficient space at the rear of the portion of the study group now completed is available for future expansion equal to twice the present needs of the Institute, and this future construction has been planned for in designing the present buildings.

It is difficult to realize the magnitude of the task that has been imposed on the architect and engineers chosen to execute this work. It means that within a little over two and a half years they have provided Technology with a magnificent new home, carefully and efficiently planned to allow for the reception of the different departments, with all the special apparatus and equipment necessary to each, so that they may move into their new quarters and continue instruction without loss of time. The consummation of this great undertaking was made possible, first, because the architect chosen is a man of broad training and ability, who has enthusiastically and conscientiously devoted himself to the problem; and second, because the engineering corporation selected to carry on the constructive work is composed largely of Technology men who have risen high in their profession, and who have succeeded, by means of their efficient organization, in pushing

the work ahead with untiring energy; and thus it is that the site on the banks of the Charles River has presented a scene of such marvelous and ever-increasing activity, particularly during the year just past.

Due to Technology ideals, this undertaking has been conducted in an entirely original manner, and it is the purpose of this article to explain, in a general way, the method used in conserving both time and energy.

It is obvious that coöperation is the paramount condition to strive for in developing any scheme, and it is particularly necessary when a problem assumes the proportions of the present one and when time is so limited. This necessity brought about the conception and erection on the site of a Technology "Service Building" large enough to house both the architectural and the engineering forces. This Service Building is approximately 120 feet by 75 feet, and contains offices for the representatives of the architect and of the engineering corporation, together with a huge drafting-room, lighted on the north by an immense skylight, running the entire length of the building, accommodating one hundred men. There are also filing-rooms and stenographers' rooms, toilets, etc. A fireproof vault opens from the drafting-room, in which all valuable drawings are placed over night, as a conflagration would mean the loss of thousands of dollars. There is a blue-printing room, equipped with a powerful machine, running water, and a forced draught, so that a print can be washed and dried within eight minutes. A type printing-press is also provided, and several adding-machines are placed in different parts of the room to assist in rapid computations. The building is efficiently



Fig. 3. Detail View across Entrance Portico back of Columns

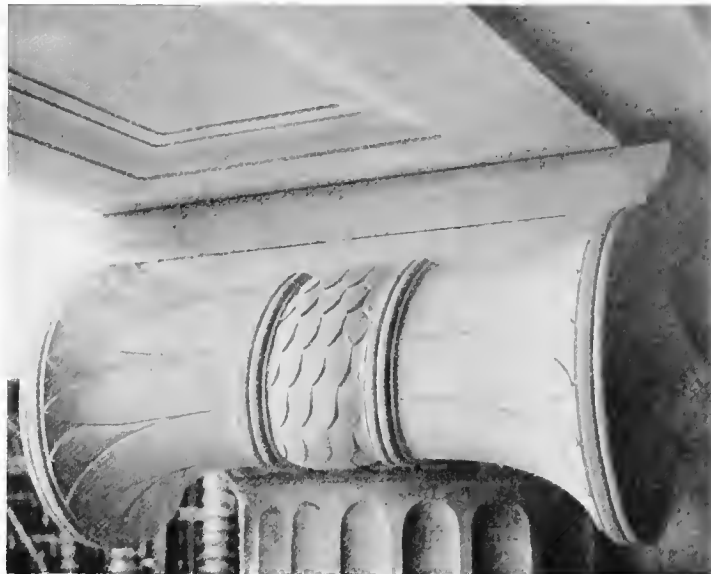


Fig 4. Detail of Column Capital



Fig. 5. View of Left Hand—Eastern Face—of Courtyard, May 11, 1915

heated, and is, indeed, in every sense of the word, a "Service Building." On the site, besides the Service Building, a Construction Office has been located, which houses the Superintendent of Construction and his Construction Staff. They have the direct oversight of all outside construction.

Although the new Technology is housed under one roof, yet the plans allow for a logical division of the buildings into different groups. The general plan is thus divided into twenty-one different sections, and each section is treated as a separate building in the preparation of floor plans and in carrying out operations on the site. The buildings are always referred to by their building numbers, shown on the plot plan in Plate LXVI. The twenty-one buildings have been divided into seven groups of three buildings each, and a foreman has charge of each group, and is directly responsible to a master foreman. Each foreman has a small office, located in close proximity to the group under his particular supervision, and these offices connect by telephone with the superintendent's office. In this way operations have been carried on simultaneously over the entire site. One thousand men were at one time engaged in excavating, filling, and driving piles. There are four railroad tracks, totaling a mile and a half of length, which traverse the site. A switching locomotive is operated exclusively for hauling immense amounts of building-materials to different portions of the grounds. Fifty-three thousand yards of fill were distributed over the area of the courtyard in order to raise the grade five feet above the River Esplanade, and in addition some thirty-five thousand yards were deposited over the remainder of the lot. One thousand tons of steel have been used on the ground. A few sta-

tistics, giving the large quantities of materials used in the buildings, may also be of interest as indicating the magnitude of the work accomplished.

Since the beginning, and during working hours, material of different kinds has been delivered to the job at the rate of one ton per minute. Forty thousand cubic yards of concrete have gone into footings and framework, and one million, six-hundred thousand square feet of wood forms have been necessary to receive the concrete. Thirty-five hundred tons of reinforcing steel have been required for the concrete, and twenty-two thousand piles have been driven — which approximate five hundred and seventy-five thousand linear feet. Two hundred and fifty thousand cubic feet of limestone have been used for exterior facing, together with six hundred thousand face brick in the interior courtyards. The common bricks used for backing up the exterior walls aggregate over three million. One hundred thousand square feet of metal window frames and sash have been installed, and five hundred thousand square feet of interior partitions erected.

The procedure by which the working drawings have been produced may be of interest. The questions of pure architectural design were studied and decided upon in Mr. Bosworth's office in New York, and the treatment of the exterior façades, as well as the general layout of plan, were there determined during the seven months preceding the erection of the Service Building. It is therefore the working and detail drawings which have been prepared in Cambridge.

After innumerable consultations with the professors in charge of the various departments of instruction at the Institute, floor plans were finally

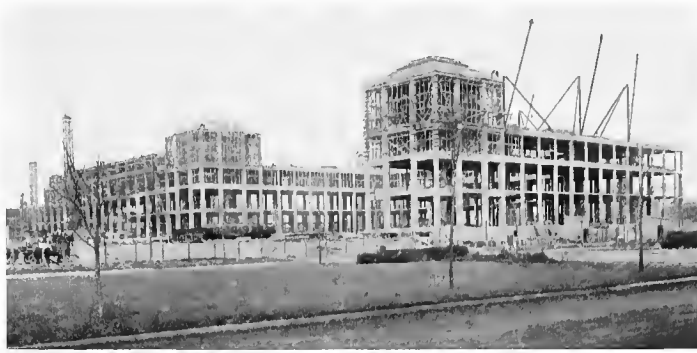


Fig. 6. View of Right—Western Face—of Courtyard, Nov. 12, 1914



Fig. 7. Detail of Right Portion of River Front of Building, March 12, 1915



Fig. 8. Detail of Western Courtyard Face, seen from Central Building, Sept. 10, 1915



Fig. 9. East Side of Buildings, showing Depth of Structure, taken from Site of Walker Memorial

evolved that satisfied their diverse requirements. In this work the Technology Faculty have been most unselfish of their time, and have shown a rare spirit of loyalty and coöperation. These plans, by buildings, were carefully drawn by the architectural division in the Service Building, indicating the position of the various laboratories, class and lecture rooms, offices, etc. At the same time elevations, sections, and details of the architectural treatment were prepared to accompany the plans. Blue-prints were then issued to the structural engineers, who designed the framing. They were enabled to do this by figuring out floor loads for the various portions of the buildings, based on data obtained by the equipment engineers. This information related the weight, size, and kind of machinery, as well as its location, and included everything making up the equipment of the Institute's great workrooms. The structural engineers thus determined the sizes of columns and beams, and prepared piling and footing plans, which were sent out on the field. At the same time, the heating and ventilating engineers were figuring where their fresh air intakes, ducts, steam-pipes, and drains could best be located. The electrical engineers were likewise at work, preparing a scheme for artificially lighting the rooms in all these buildings. These structural, heating, ventilating, and electrical plans were then referred back to the architect, for his criticism and approval, and were thus made to harmonize with the desired architectural result. They were then incorporated in the architect's final plans, and formed the basis for the working drawings. Besides these plans and elevations, large scale details were prepared showing the jointing of the stone facings for the different elevations, and the contours of cornices and other horizontal mouldings, in order that stone estimates could be procured. Full-size models of various portions of the façades were prepared, and erected in place on the site, in order to study the projections of cornice mouldings and pilaster projections, as well as the proportion of window openings.

By adopting reinforced

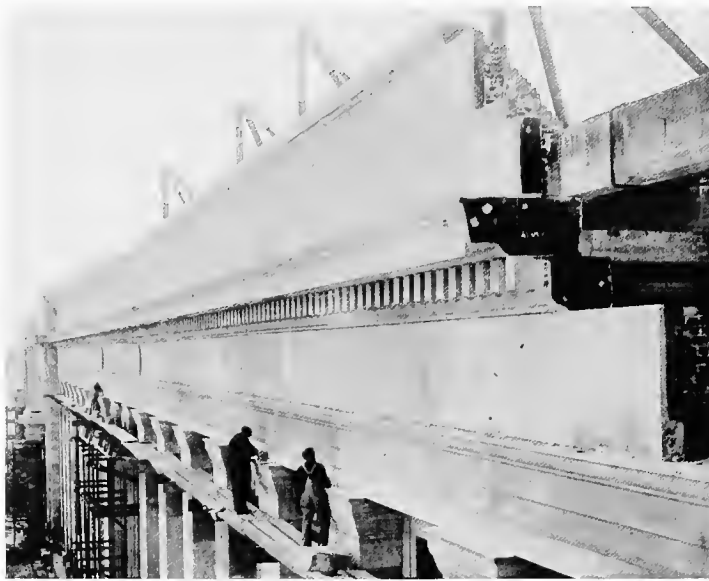


Fig. 10. Detail of Cornice (Building 7), showing Section of Mouldings and Scale of Detail



Fig. 11. View of Entrance Portico Colonnade, taken May 31, 1916



Fig. 12. Inner Portico and Main Building, facing on Courtyard, May 31, 1916

concrete construction it has been possible to carry out the erection of the skeleton framework as one complete operation, thus allowing the masonry to proceed at the base of the buildings before the upper floors were stripped of their concrete forms. As the masonry work rose it gave an opportunity to install the steel window-frames. In this way one operation followed closely on the heels of the preceding ones, and thus a great deal of time was saved.

Weekly conferences were held in the Service Building, at which all the engineers of the various branches of the work met with the architect's representative, discussed the various problems constantly arising, and arrived at decisions which could be reached only by this form of mutual coöperation.

All drawings issued by both the architect and engineers were sent to the blue-print room, with an order-card calling for a routine number of blue-prints, which were sent out automatically, according to a prearranged schedule, to the contractors, the general superintendent, the consulting engineers, and all others vitally connected with the work. The dimensions and other information on all drawings were systematically checked by both the architect's forces and by the engineers, any inaccuracies being quickly corrected by immediate consultation. The architect has maintained an inspector constantly on the job, and as the construction proceeded all minor readjustments were quickly made through the medium of the telephones distributed over the buildings and connected with the foremen's and superintendent's offices and with the Service Building.

All decisions and general information not included on the working drawings have been transmitted in written form on standard memorandum sheets, copies of which were distributed to the drafting-rooms, the superintendent, and the construction manager, and filed for reference.

After the bids on the different materials entering into the buildings had been received, they were gone over by the representatives of both the architect and the engineering corporation before any of the sub-contracts were awarded.

The Construction of the Dome

Illustrated by Construction Photographs

PRINCIPAL among the interesting features of construction of the new buildings for the Massachusetts Institute of Technology is the great dome, which rises above the central building, and is at the same time its crowning architectural feature and the most interesting instance of reinforced concrete framing to be found in the entire group.

The dome structure and the five-story building on which it rests are faced with Bedford Limestone, in harmony with the other buildings. The supporting structure, built entirely of reinforced concrete, and following the lines of the architectural design, is in the form of two tiers of cylinders or drums, the upper drum surmounted by the dome proper. The lower half of the dome is formed with steps, and the upper half is a truncated sphere, with a skylight in the flat top to admit light to the library reading-room below.

The drums are supported on two circumferential rows of columns, the outside row of the lowest drum resting on a ring girder which in turn rests upon the beams of the fifth floor of the main building. The outside row of the upper drum also rests on a ring girder, which spans the radial beams connecting the outer and inner columns of the lower drum. The inner columns of both drums, eight in number, are continuous with the columns of the main building below. Ring girders support both the upper and lower planes of the spherical portion of the dome. The stepped portion of the dome is formed in reinforced concrete slabs, resting on radial inclined girders spanning the outer and inner columns of the upper drum. The slab varies in thickness from five inches at the top to eight inches at the bottom. The reinforcement is in the form of cross-webbing of twisted rods.

The top of the dome is one hundred forty-seven

and one half feet above the general level of the site and sixty-five feet above the parapets of the adjoining buildings. The lower drum is one hundred and twenty feet in diameter and the upper drum one hundred and eight feet in diameter. The curved, or spherical, section of the dome is seventy feet in diameter.

The structure supporting the dome is remarkable in that it, inside, suggests in no way the large circle of the dome above, but is utilized for various important purposes, including an entrance-hall; a crane runway, one bay wide, in the basement and first story, extending the full width of the building; a lecture-room in the second and third stories, which will seat five hundred and fifty people, and has only two free standing columns exposed; and, on the fifth floor, the great circular library, directly beneath the dome, with a reading-room seventy feet in diameter and seventy feet high, and stack space for three hundred and fifty thousand volumes.

In the Pratt School of Naval Architecture (Building No. 19 on the plot plan), to be located on Massachusetts Avenue immediately beyond the point at which the façade extending along that street now stops, and which will probably be the first of the future additions to the main buildings to be erected, a larger auditorium, seating two thousand people, will be provided.

The portion of the main study buildings now built provides facilities for two thousand students, and the space contemplated in the plans for future additions will more than double that capacity.

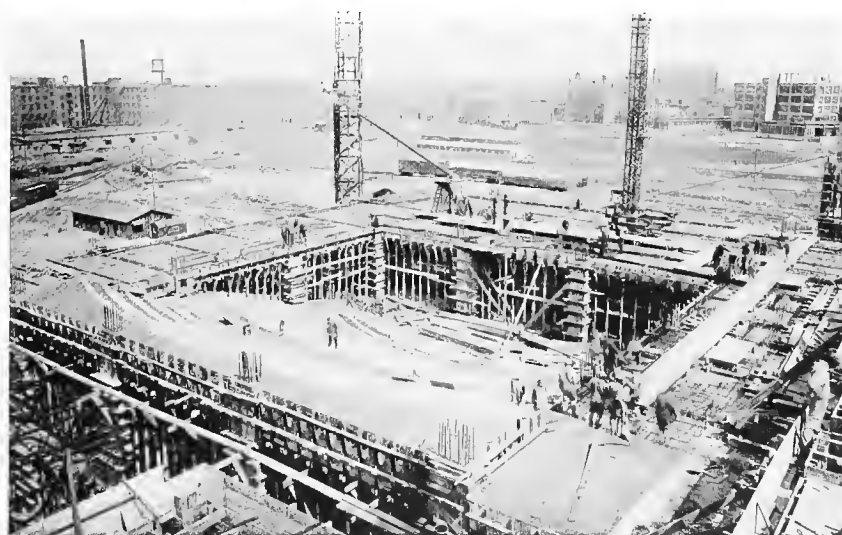
The present scheme provides internal partitions of an easily removable nature, so that class-rooms or laboratories can be enlarged or made smaller, as necessity demands. The big central library and the administrative offices, under the dome, are centrally located for both present and future development.



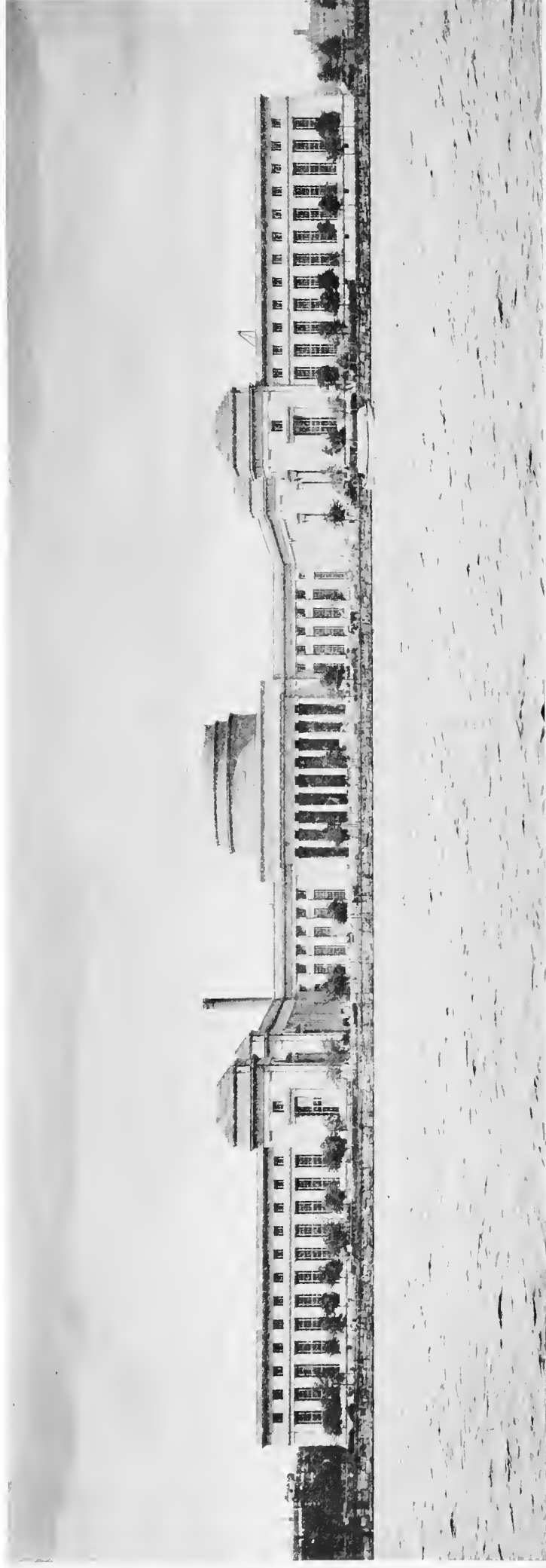
The Dome (Building 17), looking East from Massachusetts Ave., Sept. 10, 1915



Looking down along West Courtyard Wing, from the Dome, Aug. 12, 1915



Casting the Auditorium under the Dome, as the Walls Went Up, April 9, 1915



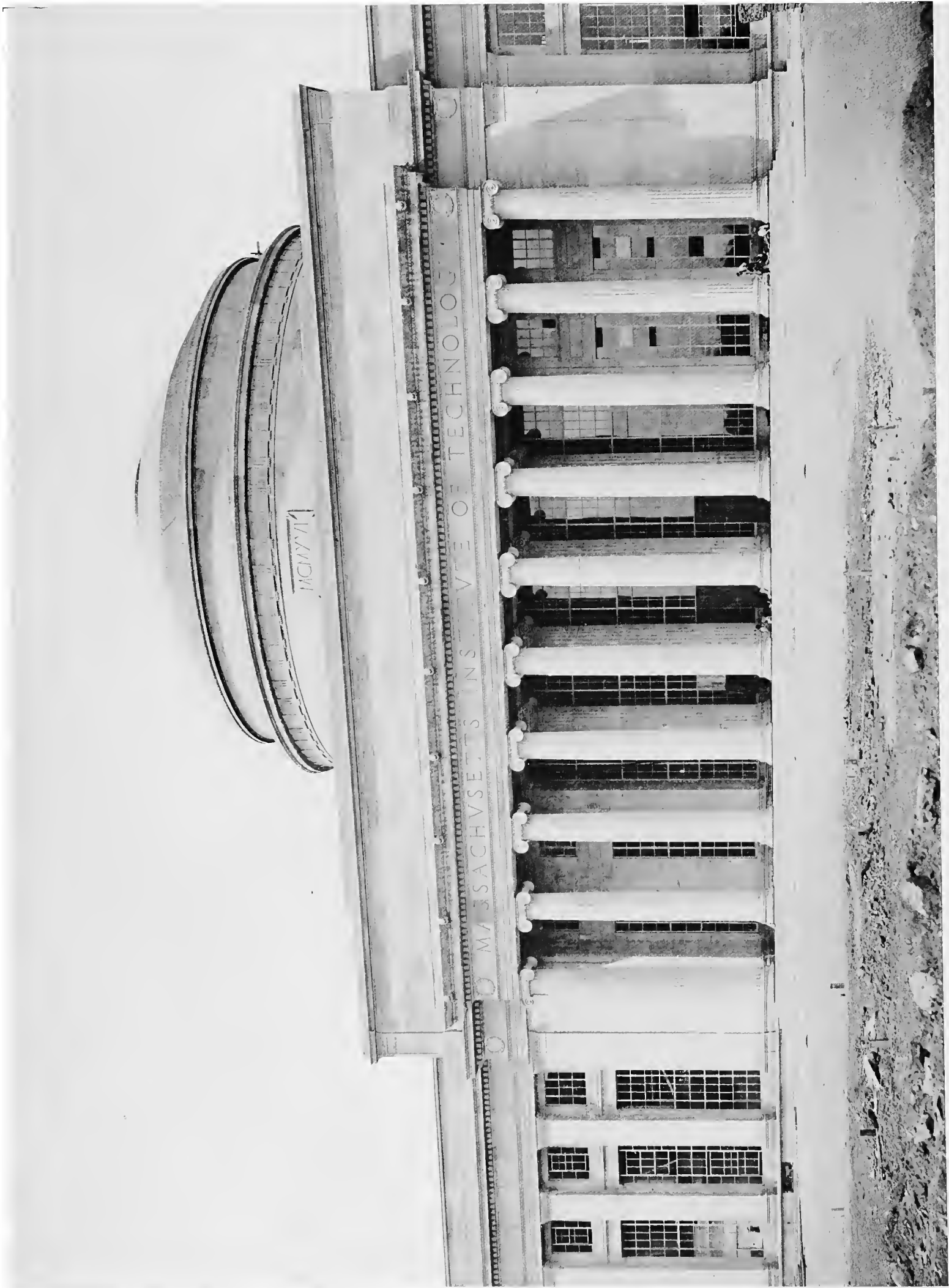
GENERAL VIEW FROM THE RIVER



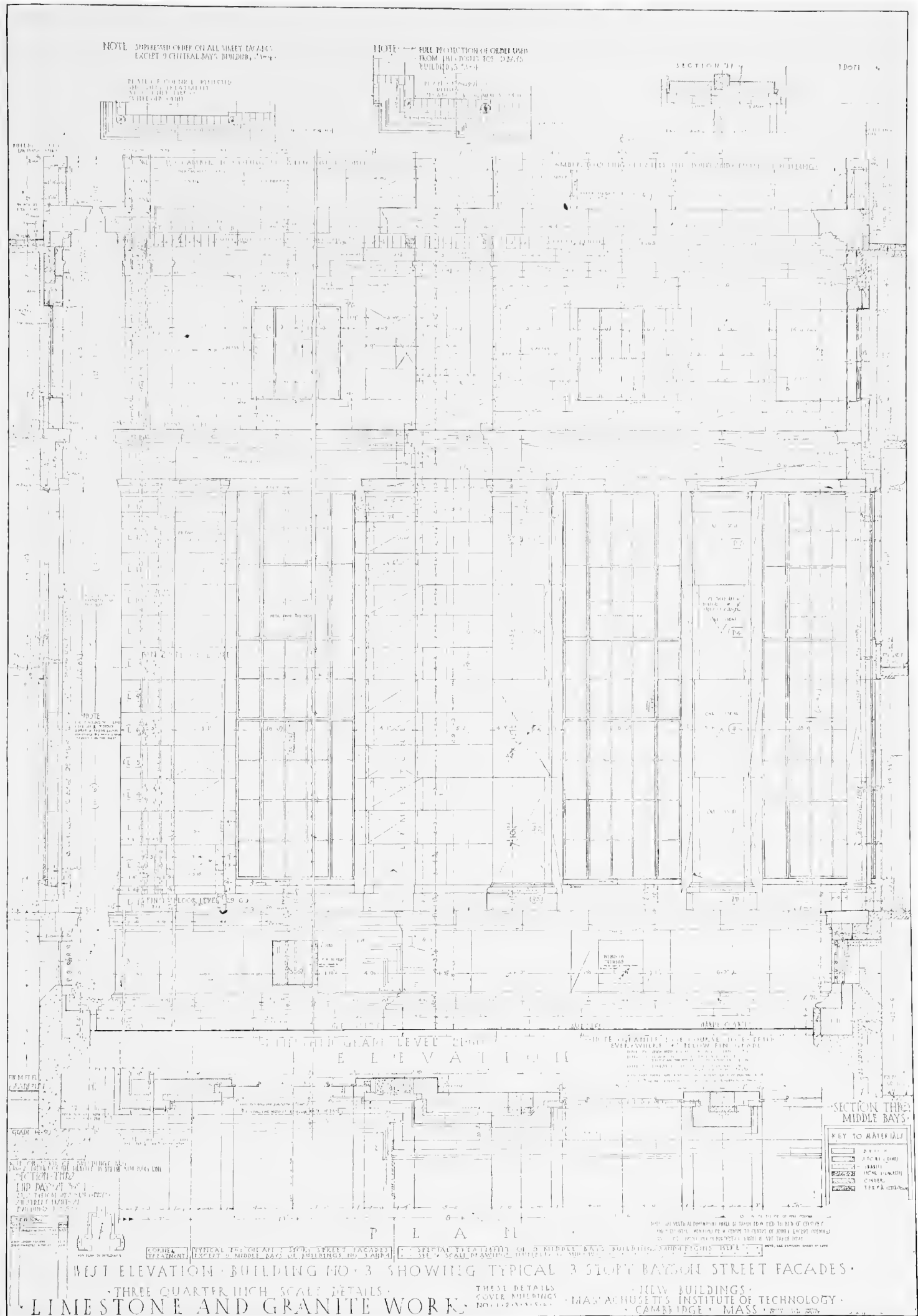
GENERAL VIEW OF PRINCIPAL COURT
NEW BUILDINGS FOR THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.
WM. WELLS BOSWORTH, ARCHITECT



VIEW ACROSS THE MINOR FORECOURTS, LOOKING EAST
NEW BUILDINGS FOR THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.
WM. WELLES BOSWORTH, ARCHITECT



GENERAL VIEW OF DOME AND MAIN PORTICO
NEW BUILDINGS FOR THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.
WM. WELLES BOSWORTH, ARCHITECT

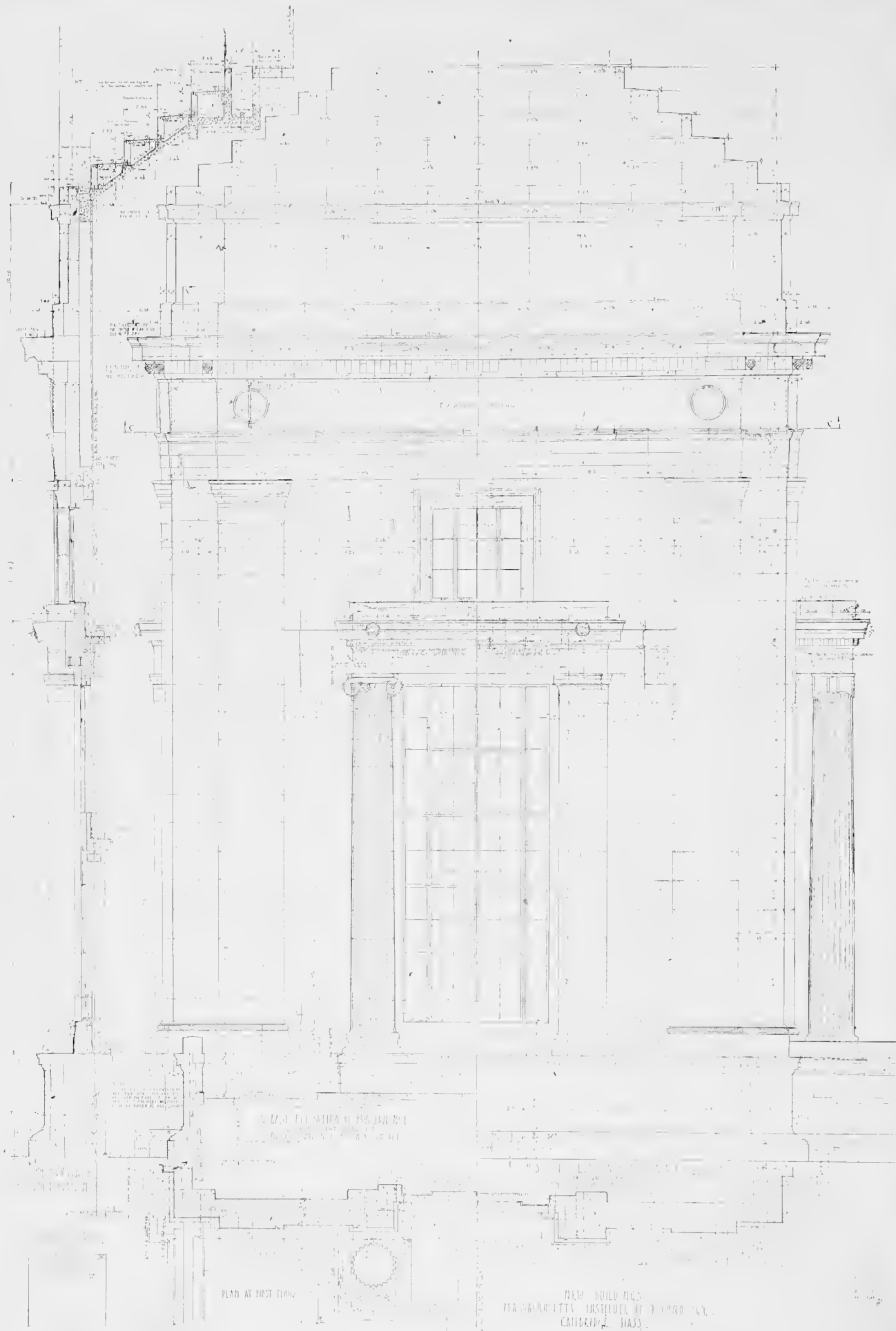


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DETAIL ELEVATION OF TYPICAL BAYS TREATMENT

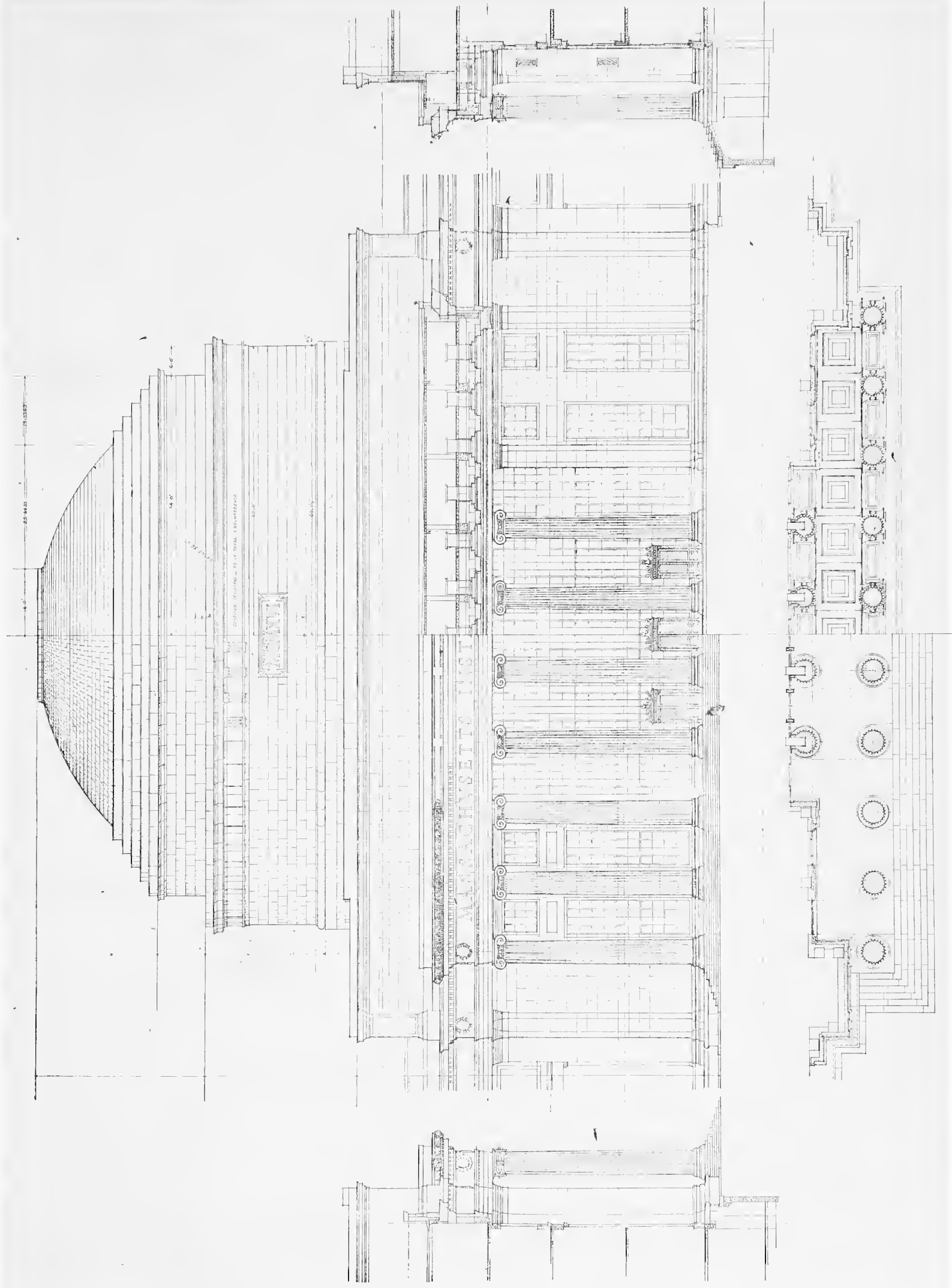
NEW BUILDINGS FOR THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.

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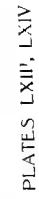
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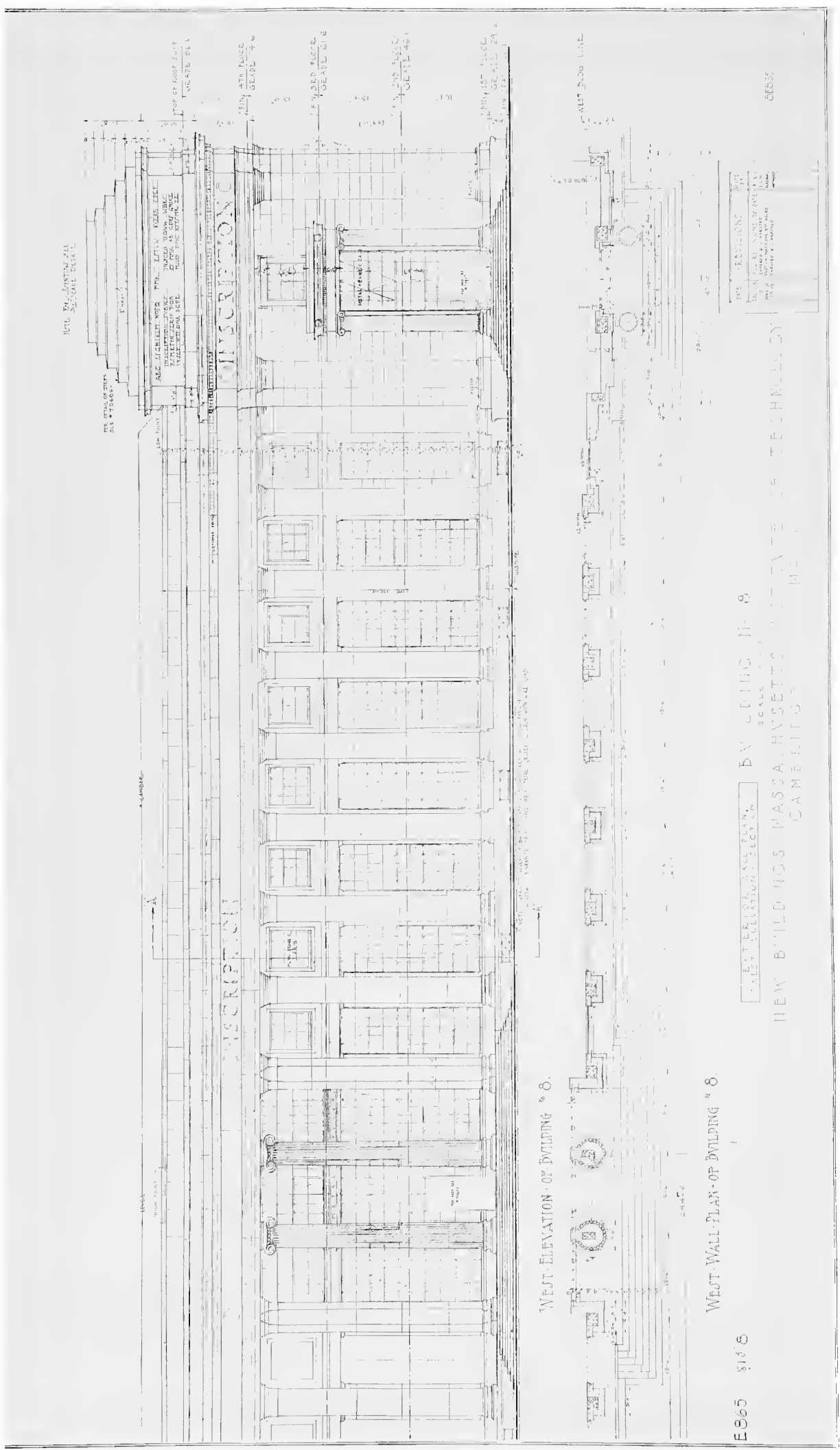
DETAIL OF CORNER PAVILION, WEST SIDE OF COURT
 NEW BUILDINGS FOR THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.
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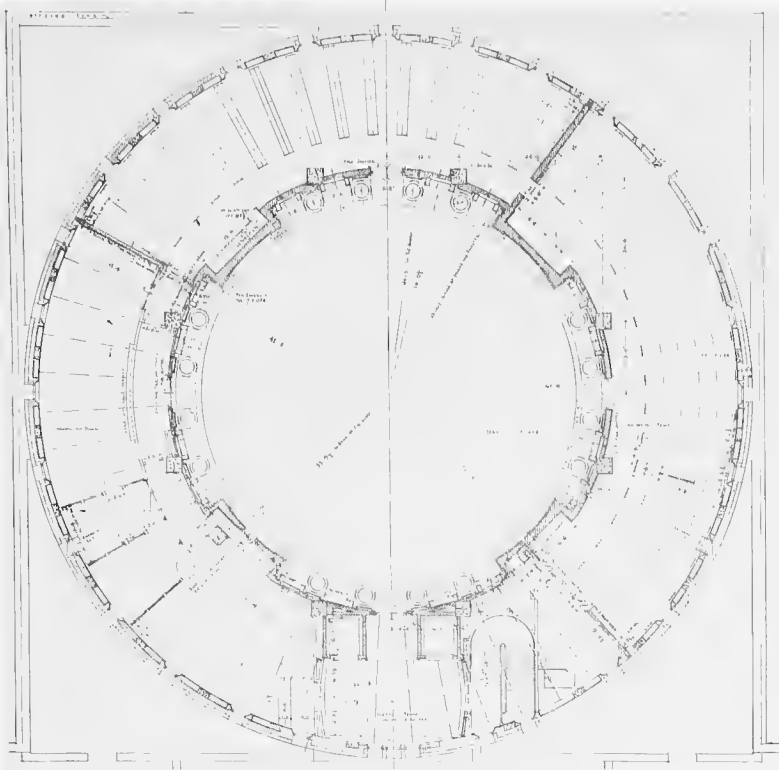
ELEVATION OF MAIN PORTICO, ENTRANCE, AND DOME
NEW BUILDINGS FOR THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.
WM. WELLES BOSWORTH, ARCHITECT



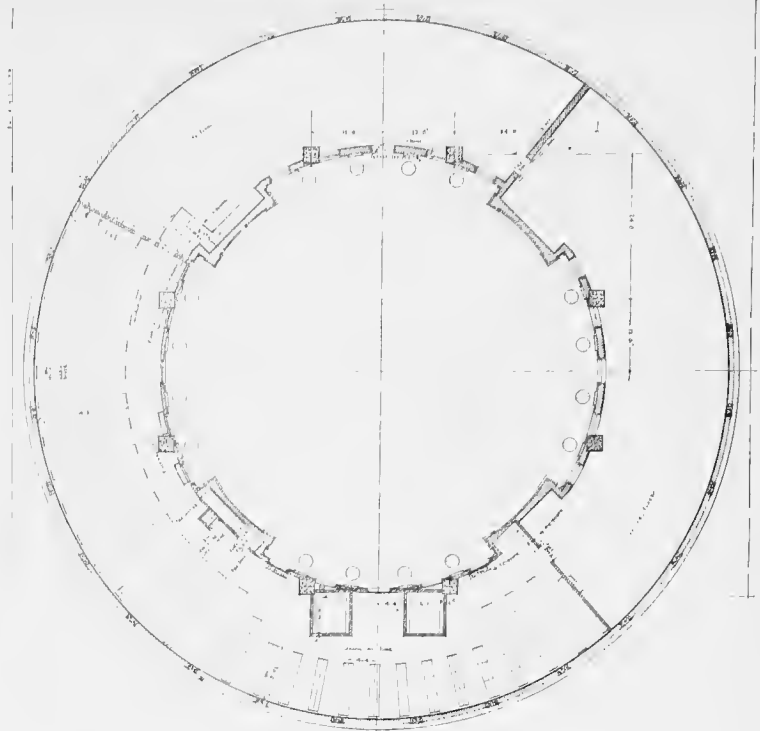


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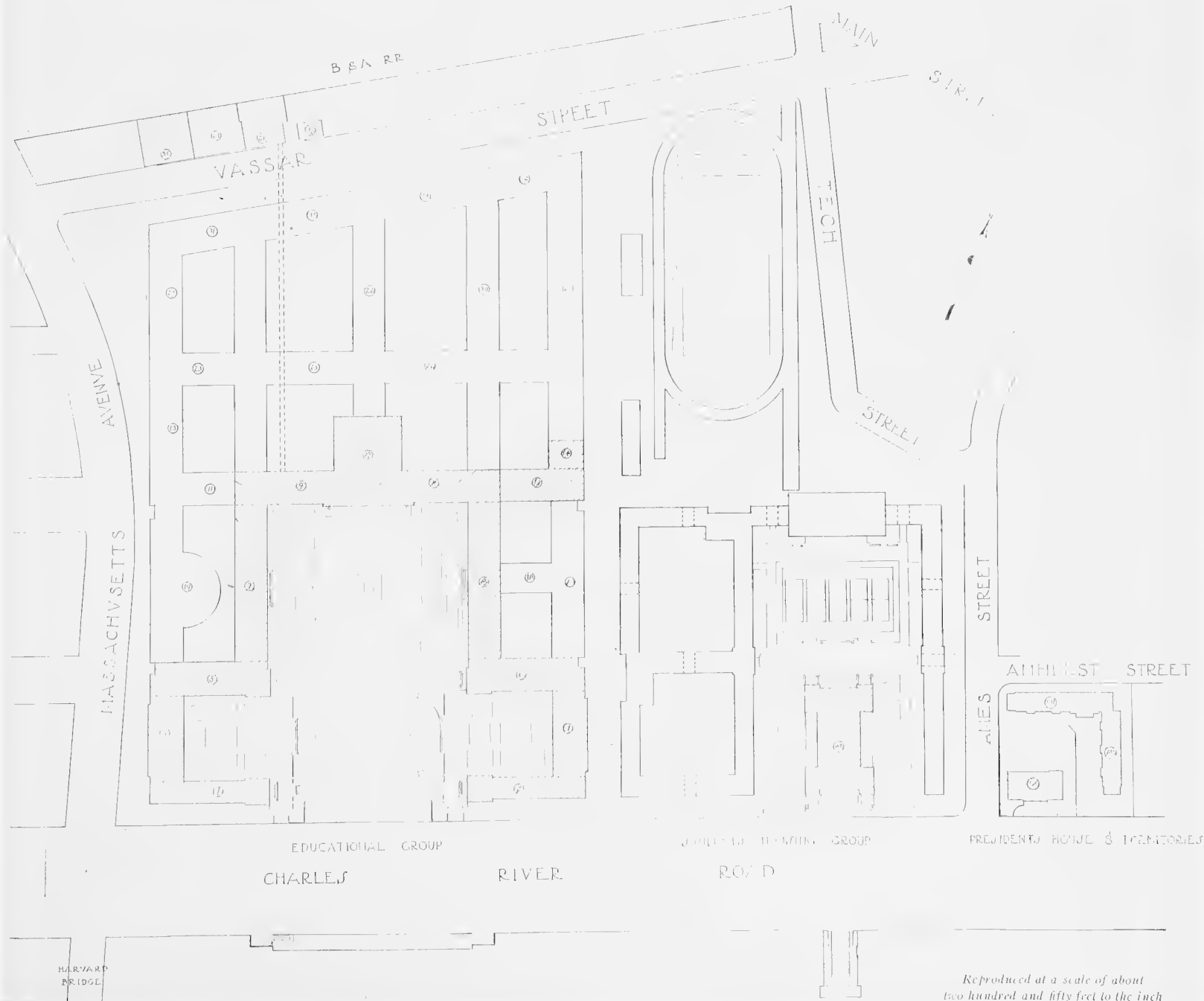
PORTION OF WEST ELEVATION ON MAIN COURT
NEW BUILDINGS FOR THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.
WILLIAMS BOWEN, ARCHITECT



LIBRARY, FIFTH-FLOOR PLAN



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SECOND-TIER STACK PLAN

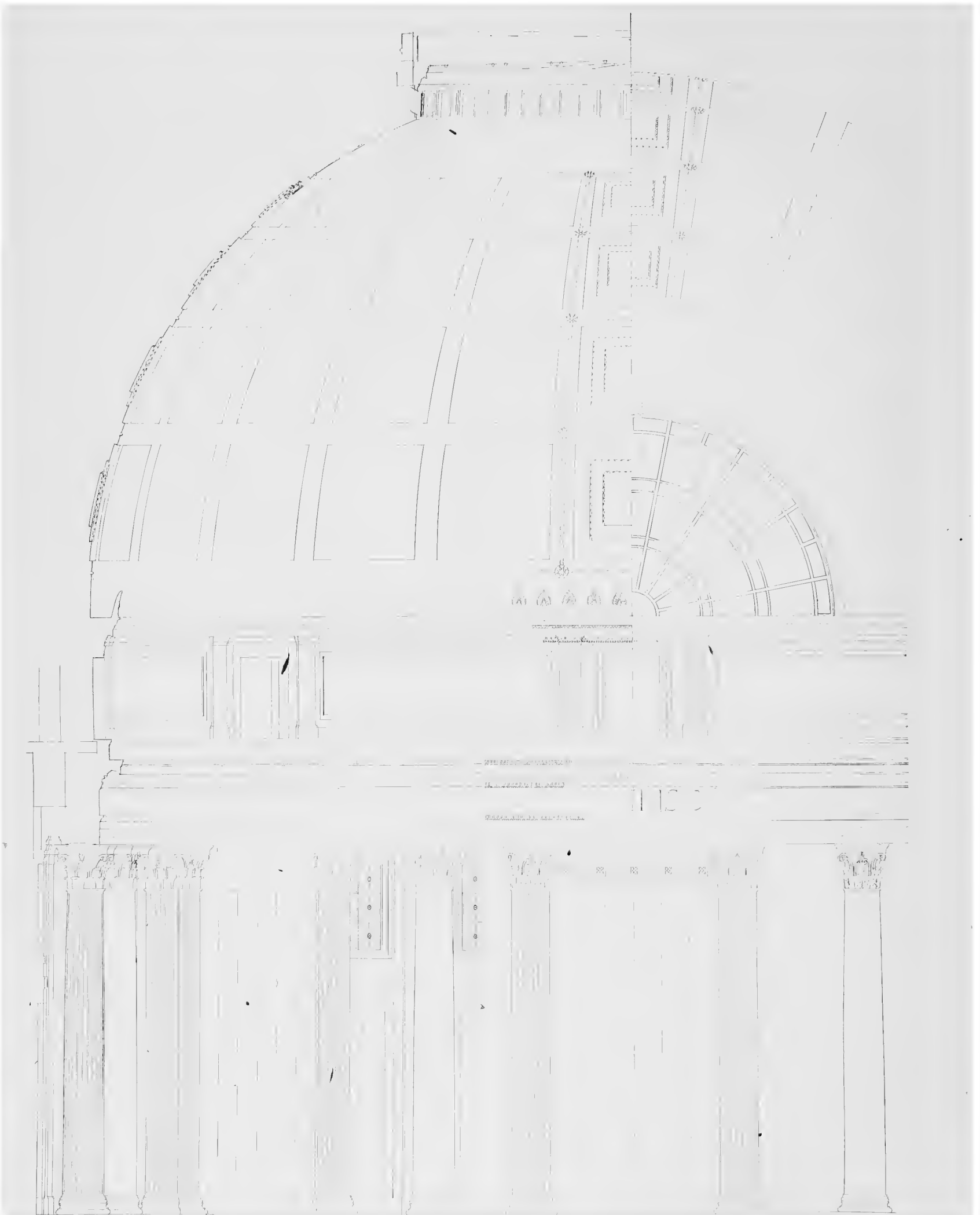


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—PLOT PLAN OF TECHNOLOGY GROUP

NEW BUILDINGS FOR THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.

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SCALE DETAIL OF LIBRARY
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DETAIL OF ENTRANCE PORTICO
NEW BUILDINGS FOR THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.
WM. WELLES BOSWORTH, ARCHITECT



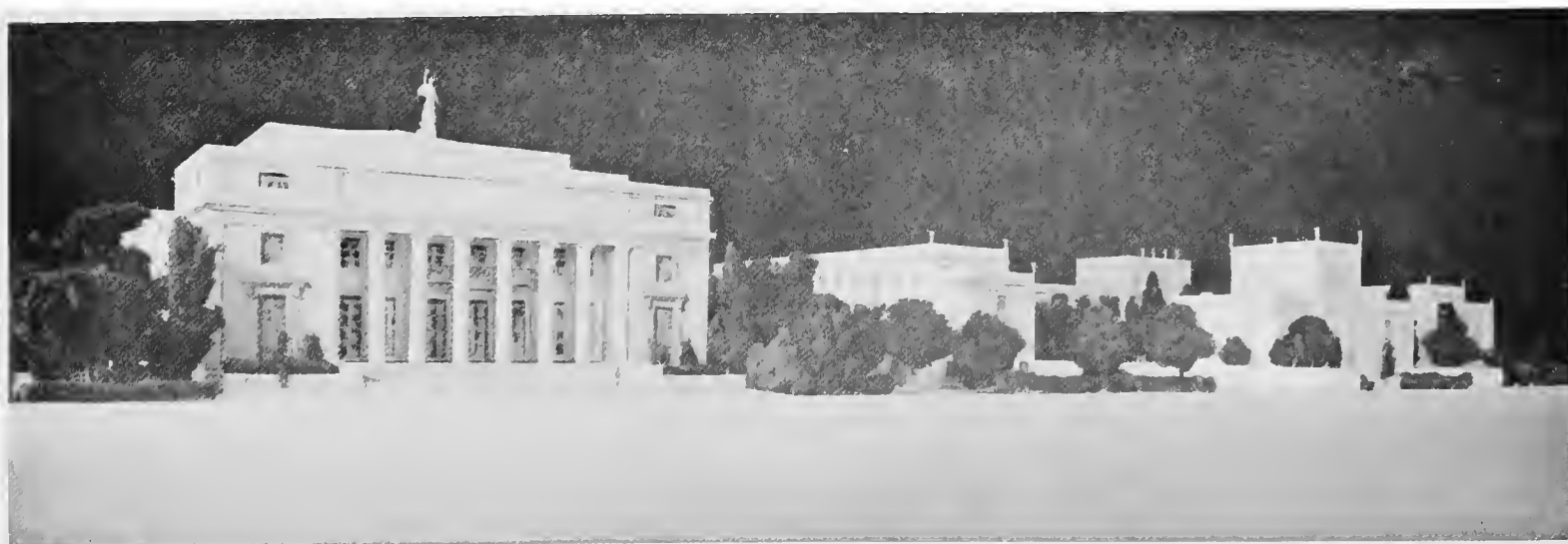
DETAIL OF CORNER PAVILION, SHOWING FAÇADE TOWARD MINOR COURT
NEW BUILDINGS FOR THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.
WM. WILLES BOSWORTH, ARCHITECT



DETAIL OF PAVILION, SHOWING PRINCIPAL COURT FACE
NEW BUILDINGS FOR THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.
WM. WELLES BOSWORTH, ARCHITECT



The Walker Memorial Building, from a Pastel Drawing by Birch Burdette Long



Photograph of Model showing Eastern Portion of River Frontage, including the Walker Memorial and Dormitory Buildings Beyond
Wm. Welles Bosworth, Architect

THE study group of buildings being located on the western half of the site leaves the eastern half available for the dormitories and other student buildings, giving them a retired situation, where boating and athletic interests can be easily maintained. This portion of the site is also conveniently near a subway station, making it easily accessible from Boston.

In this student group the Walker Memorial has properly been located on the main axis, facing upon the Esplanade, with dormitories on either side. In the rear of the Club House is an open court utilized for tennis-courts, and the athletic field extends the remaining depth of the site, with other dormitories and a gymnasium fronting the court on both sides.

The Institute will naturally grow to the east, and in this event the student group of buildings might become the central axis of a future group that may extend along the entire Cambridge side of the water-front, from bridge to bridge.

While the Walker Memorial and the dormitories grouped about it have not yet been started, work is well along on the dormitory group located still further to the east (see plan on Plate LXVI), the design of which is clearly shown by Mr. Birch Burdette Long's sketches upon this page.

The President's House — shown by Mr. Long's studies on page 92 — is located facing on the River Esplanade in the angle inclosed by this dormitory group, the garden extending out at the back, and filling out the rest of this quadrangular area. The Students' Club House — the Walker Memorial itself — is also soon to be started, and the design for this building is shown by the perspective sketch on page 90, while its relation to the dormitory group is indicated by the photograph of the sketch model reproduced below upon this same page.

While these buildings, on the river side at least, are to be constructed in the same manner and faced with the same material as the study group, it was felt that a distinctly more residential type of architecture, with an entirely different scale, was necessarily to be adopted in their design, the general character of which is foreshadowed by the accompanying preliminary studies working out the architect's preliminary designs.



Detail Sketch of Entrance



Perspective View of the Dormitories Now Being Constructed
Wm. Welles Bosworth, Architect



View of River Front



Garden Side, Studies for President's House
Wm. Welles Bosworth, Architect

